

**Follow-Up Audit  
City's Flood Response**

September 2001

**City Auditor's Office**

**City of Kansas City, Missouri**

September 19, 2001

Honorable Mayor and Members of the City Council:

This follow-up report of the city's response to flash floods was initiated by the city auditor pursuant to Article II, Section 13 of the city charter. The follow-up focuses on progress made in addressing issues identified in our November 1998 inquiry into conditions affecting the city's response to the October 4, 1998 flood.

The city has made considerable progress in addressing problems relating to its response to flash floods. Responsibility for emergency management was moved from the Fire Department to the City Manager's Office, and an emergency manager was hired in October 1999. At the time of our original report, the city did not have a comprehensive plan for responding to flooding. The emergency manager recently drafted a comprehensive emergency operations plan for all types of disasters and a plan for responding to flash flooding including procedures for monitoring conditions in the field and closing streets. The city manager expects to present the comprehensive plan to the mayor and City Council by the end of the year. In addition, the city's relationship with the National Weather Service has been clarified through the adoption of a Memorandum of Understanding.

The city's efforts to detect floods and educate the public about flooding are better now than in 1998. The city's flood warning devices – gauges that measure stream level and rain – are more reliable. Although the gauges work better, Water Services has identified some reliability problems and plans to repair the gauges. Improving the reliability of the gauges should improve the city's ability to monitor flooding. Since the 1998 flood, the city has also provided public education, including television announcements and inserts in local publications.

We sent the draft follow-up report to the city manager and the director of Water Services on August 9, 2001. Their written responses are included as appendices. We appreciate the courtesy and cooperation extended to us during this project by staff in Emergency Management, City Communications, and the Fire, Parks and Recreation, Public Works, and Water Services departments, as well as staff at the National Weather Service. The audit team for this project was Julia Terenjuk and Michael Eglinski.

Mark Funkhouser  
City Auditor

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# Follow-up Audit: City's Flood Response

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## Table of Contents

Introduction	1
Objectives	1
Scope and Methodology	1
Background	2
Summary of the 1998 Memorandum	3
Findings and Recommendations	5
Summary	5
Development of a Comprehensive Response to Flash Floods Is Underway	5
Emergency Management Function Moved to City Manager's Office	6
Emergency Manager Drafted Formal Response Plan	6
Agreement with National Weather Service Defines Responsibilities	7
Flash Flood Detection and Public Education Efforts Have Improved	8
Flash Flood Detection Has Improved	8
Public Education Efforts Have Increased	8
Recommendations	9
Appendices	11
Appendix A: Prior Recommendations	11
Appendix B: City Manager's Response	15
Appendix C: Director of Water Services' Response	19

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## List of Exhibits

Exhibit 1. Major Departments' Flood-Related Responsibilities	7
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## Introduction

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### Objectives

This follow-up audit of the city's flood response was conducted pursuant to Article II, Section 13 of the Charter of Kansas City, Missouri, which establishes the Office of the City Auditor and outlines the city auditor's primary duties.

A performance audit is an objective, systematic examination of evidence to independently assess the performance of a government organization, program, activity, or function in order to provide information to improve public accountability and facilitate decision-making.<sup>1</sup> A follow-up audit examines the action an agency has taken in response to the findings and recommendations from a previous report.

This follow-up audit was designed to answer the following questions:

- Has the city developed a comprehensive flood response plan?
- Is the flood warning system functioning?

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### Scope and Methodology

This follow-up audit was designed to determine the progress made in addressing issues raised in our 1998 memorandum<sup>2</sup> on the city's response to flash floods. The follow-up audit was not designed nor intended to evaluate the effectiveness of the city's flood response or performance of any department involved with the flood response function. The follow-up audit was performed in accordance with generally accepted government auditing standards. Audit methods included the following:

- Comparing the city's plan to the elements of a comprehensive flood response plan identified by experts.

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<sup>1</sup> Comptroller General of the United States, *Government Auditing Standards* (Washington, DC: U.S. Government Printing Office, 1994), p. 14.

<sup>2</sup> Memorandum from City Auditor Mark Funkhouser to Mayor Emanuel Cleaver II and members of the City Council, November 12, 1998.

- Interviewing city staff in Emergency Management, City Communications, and the Water Services, Public Works, Parks and Recreation, Fire, and Police departments, and staff at the National Weather Service.
- Reviewing documents, city plans, and literature related to emergency response to floods.
- Reviewing literature related to flood-warning systems.
- Reviewing the Memorandum of Understanding with the National Weather Service.
- Observing maintenance procedures at gauge sites.
- Visiting the emergency operations center and the Water Services Department barricade storage site.
- Observing activation of the emergency operations center on June 4, 2001.

No information was omitted from this report because it was deemed privileged or confidential.

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## **Background**

Floods are a relatively common natural disaster which can result in great economic loss and loss of life. Several factors contribute to flash flooding, including the rate of rainfall and how long the rain lasts. Topography, soil conditions, and ground cover also play important roles. Flash floods occur within minutes and can roll boulders, tear out trees, and destroy buildings and bridges. Rapidly rising water can reach heights of 30 feet or more. Sudden floods can occur without warning. Most flood deaths occur in flash floods.<sup>3</sup>

According to the city's Office of Emergency Management, severe weather poses the greatest hazard to the city. As described in the draft comprehensive emergency operations plan, flash floods and slow-rising floods constitute the highest risk, where risk is based on the likelihood of the hazard and vulnerability to the hazard.<sup>4</sup> Floods occur primarily in the spring and fall.

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<sup>3</sup> U.S. Department of Commerce, *flash floods and floods. . . the Awesome Power!*, July 1992, p. 1.

<sup>4</sup> *Draft - Comprehensive Emergency Operations Plan, Basic Plan*, April 2001, pp. 7-8.

### **Summary of the 1998 Memorandum**

On October 4, 1998, a severe rainstorm caused flash flooding in the Kansas City area. Mayor Emanuel Cleaver II requested that the City Auditor's Office conduct an inquiry into the city's response to the flood. Our November 1998 memorandum disclosed conditions that affected the city's response to flood emergencies.

The city did not have a comprehensive plan for responding to floods that included routine identification, monitoring, and blocking of flooded streets and bridges; nor was there an educational program in place to explain the risks of traveling during flood emergencies and driving through standing or flowing water.

To improve city responsiveness in future flash flooding situations, we recommended the city manager oversee the development of a comprehensive plan for flash flooding. Responsibilities of the city and the National Weather Service for the warning system should be written and accepted by the mayor and City Council by ordinance. In addition, we recommended that steps be taken to ensure personnel responsible for the warning system are able to perform the work, and that Emergency Preparedness be moved to the City Manager's Office. Finally, we recommended that the city initiate a public education effort.

The original recommendations are included in Appendix A.



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## **Findings and Recommendations**

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### **Summary**

The city has made progress in addressing problems related to its response to flash floods. Responsibility for emergency management has moved from the Fire Department to the City Manager's Office and the city's relationship with the National Weather Service has been clarified and formalized in a Memorandum of Understanding. After the 1998 flood, the city began developing a comprehensive response to flash floods. The emergency manager, hired in October 1999, has drafted a basic emergency operations plan and a plan specifically for flash flooding. The flood plan formalizes the city's response to flood emergencies, including how the city will identify flood-prone areas and respond to possible flooding. The emergency manager plans to present the basic operations plan to the mayor and City Council for adoption.

The city's efforts to detect floods and educate the public about flooding are better now than in 1998. The city's flood warning devices – gauges that measure stream level and rain – are more reliable now than during the 1998 flood. Although the gauges work better, Water Services has identified some reliability problems and plans to repair the gauges. Improving the reliability of the gauges should improve the city's ability to monitor flooding. Since the 1998 flood, the city has also provided public education, including television announcements and inserts in local publications.

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### **Development of a Comprehensive Response to Flash Floods Is Underway**

Subsequent to the 1998 flood, the city began to develop a comprehensive response to flash floods. The emergency management function was moved to the City Manager's Office, and the emergency manager drafted a plan for responding to flooding. In addition, the city's relationship with the National Weather Service was clarified in a Memorandum of Understanding that describes the roles and responsibilities of both entities.



### **Emergency Management Function Moved to City Manager's Office**

The emergency management function was moved to the City Manager's Office in November 1998. At the time of the 1998 flash flood, the emergency management function was housed within the Fire Department. We recommended that the function be moved to the City Manager's Office to provide the function with higher status and visibility. In November 1998, the City Council passed Ordinance 981304 creating an Office of Emergency Management as part of the City Manager's Office. Under the ordinance, the city manager was required to appoint an emergency manager with responsibility for developing a comprehensive, risk-based, all-hazard emergency operations plan. The emergency manager was hired in October 1999.

### **Emergency Manager Drafted Formal Response Plan**

The emergency manager has drafted an overall emergency operations plan and two documents specific to flash flood responses. At the time of the 1998 flood, the city did not have a comprehensive plan for responding to flooding. While the city had an emergency action plan for flooding on Brush Creek, the plan did not include specific procedures for blocking streets. We had recommended the city manager develop a comprehensive plan.

The draft emergency operations plan describes city operations during any type of disaster, including those caused by severe weather, and assigns responsibilities for emergency planning and operations. An additional draft plan describes in detail how the city will identify and monitor flooding and includes procedures for monitoring conditions in the field and closing streets. These documents also clarify which departments are responsible for what efforts. (See Exhibit 1.)

The emergency manager plans to present the basic plan for adoption to the mayor and City Council before January 1, 2002. The 1998 ordinance required the plan to be presented to the mayor and City Council.<sup>5</sup> To clarify responsibilities and ensure accountability for how the city will respond to all types of emergencies, including floods, the city manager should submit an emergency operations plan to the mayor and City Council by January 1, 2002.

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<sup>5</sup> Ordinance No. 981304, § 1, November 19, 1998.

Exhibit 1. Major Departments' Flood-Related Responsibilities

Department	Responsibilities
City Manager	<i>Emergency Management.</i> Serve as the city's chief advisor regarding emergency management activities before, during, and after a flood. <i>City Communications.</i> Provide emergency information to the public via all feasible means.
Fire	Support traffic control and street barricading functions. Coordinate search and rescue operations. Assist with the recovery and identification of victims. Support emergency medical operations and warnings.
Parks and Recreation	Close streets and place barricades within a designated area.
Police	Coordinate perimeter security, on-scene safety, and crowd and traffic control during and following a flood.
Public Works	Close streets and place barricades within a designated area. Support traffic control and assist with emergency warnings and disaster communication.
Water Services	Maintain and monitor the city flood warning and control system. Close streets and place barricades within a designated area. Coordinate street closure and barricade placement efforts.

Sources: *Draft - Comprehensive Emergency Operations Plan*, April 2001; *Draft - Flash Flood Response Plan, Concept of Operations for Field Monitoring, Street Closure and Barricade Use*, January 2000.

### Agreement with National Weather Service Defines Responsibilities

In 1999, the city entered into a Memorandum of Understanding (MOU) with the National Weather Service. We recommended the city manager clarify the responsibilities of the city and the National Weather Service for the warning system through a written agreement. Among other duties, the MOU specifies that the National Weather Service will provide assistance in rain gauge and stream gauge site selection, apply for and retain the licenses required for the flood warning system, and perform various forecast and warning activities.

The city's responsibilities under the MOU are to ensure development of the emergency response plan, initiate actions outlined in the plan when necessary, and maintain and ensure continuous operation of the flood warning system.

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## **Flash Flood Detection and Public Education Efforts Have Improved**

The city's efforts to detect floods and educate the public about flooding are better now than in 1998. The city's flood warning devices – gauges that measure stream level and rain – are more reliable. Although the gauges work better, Water Services has identified some reliability problems with the gauges but plans to repair them. Improving the reliability of the gauges should improve the city's ability to monitor flooding. Since the 1998 flood, the city has also provided public education, including television announcements and inserts in local publications.

### **Flash Flood Detection Has Improved**

The city's flood warning devices – gauges that measure stream level and rain – are more reliable now than during the 1998 flood. Fewer than half of the gauges were working during the 1998 flood. Since the flood, Water Services status reports show that about 90 percent of the gauges are working.<sup>6</sup> In addition to monitoring the gauges, the emergency manager developed plans that call for city field staff to monitor conditions during heavy rain or when heavy rain is forecast.

Although the gauges work better, some of the gauges perform poorly during heavy rain. The department plans to contract for repairing the gauges and ongoing maintenance. Improving the reliability of the gauges should improve the city's ability to detect and monitor flooding.

To ensure that the mayor and City Council are aware of the status of the gauges, the director of Water Services should report on the status of the rain and stream level gauges and on work to address problems with the gauges. The report should be made to the City Council by November 1, 2001.

### **Public Education Efforts Have Increased**

Since the October 1998 flood, the city has provided some public education about the dangers of flash flooding. At the time of the flood, the city did not have a program in place to warn the public about the dangers of flash flooding. We recommended that the city manager initiate a public education effort. Since then, Emergency Management

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<sup>6</sup> We reviewed 24 status reports from October 1998 through May 2001. On average 89 percent of the gauges were operational.

coordinated the placement of inserts regarding floods into several publications, including a two-page preparedness insert in the telephone book. The city periodically participates on *Talk of the Town*, a local government access television show on Channel 2, by presenting a segment on flash flood preparedness and response. During down times, Channel 2 also airs 30-second spots explaining the dangers of floods.

The city's website also contains information on disaster mitigation and preparedness, emergency management training, and severe weather. This year, the city also had an emergency management booth at the spring Kansas City Home Show.

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## Recommendations

1. The city manager should submit an emergency operations plan to the mayor and City Council by January 1, 2002.
2. The director of Water Services should prepare a report describing the department's efforts to maintain and repair all of the city's rain and stream level gauges. The report should be presented to the mayor and City Council by November 1, 2001.



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## **Appendix A**

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### **Prior Recommendations**



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**Prior Recommendations**

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1. The city manager should develop a comprehensive plan for implementing a flood warning system.
  2. The city manager should complete negotiations and approve a Memorandum of Understanding with the National Weather Service.
  3. The city manager should ensure that staff responsible for monitoring and maintaining the flood warning equipment are qualified to perform the work and interpret the results.
  4. The city manager should move Emergency Preparedness from the Fire Department to the City Manager's Office.
  5. The city manager should initiate a public education effort. Provide ongoing information to the public on the dangers related to flash flooding, the city's response efforts, and the precautions to take during flash flood watches and warnings.
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## **Appendix B**

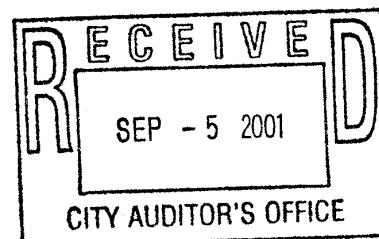
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### **City Manager's Response**





## OFFICE OF THE CITY MANAGER



**DATE:** September 5, 2001  
**TO:** Mark Funkhouser, City Auditor  
**FROM:** Robert L. Collins, City Manager  
**SUBJECT:** Follow-Up Report on City's Flood Response

I have reviewed your revised draft report forwarded to me via memo dated August 31, 2001 and agree with your recommendations.

As your report reflects, there has been substantial positive change to our flash flood response planning and procedures. I am very pleased with the progress we have made to date. The interim flash flood response plan has been activated eleven times since the first of the year. Eight of those activations resulted in monitoring of events only while three resulted in Level II activations of the Emergency Operations Center. As you noted, these activations were triggered by our vastly improved monitoring capabilities. From a review of post-activation reports and discussions with staff, the flood gauge and monitoring system has progressed to being a highly accurate and dependable system with further improvements in the works.

In addition to the improved gauge and monitoring system, our increased barricade inventory and barricade zone plan using Public Works, Water Services and Parks & Recreation crews also attests to a greatly improved program. I am confident that through these program changes and pro-active responses, we are better prepared for flash flooding events such as the one that occurred in October 1998.

If you have any questions, please feel free to contact me.

Robert L. Collins

RLC:emm

cc: Rich Noll, Assistant City Manager  
Mike Karl, Manager, Emergency Management



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## **Appendix C**

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### **Director of Water Services' Response**





## Inter-Departmental Communication

DATE: August 29, 2001  
 TO: Mark Funkhouser, City Auditor  
 FROM: Gurnie Gunter, Director of Water Services  
 SUBJECT: Follow-up Audit: City's Flood Response

### Recommendation 2. Agree

We have reviewed the City Auditor's Office, "*Follow-up Audit: City's Flood Response*", September 2001 and agree with recommendation #2. As noted in the audit, the Water Services Department has improved the effectiveness of the City's flood response warning system. Department efforts have increased gauge operability from less than half to almost 90 percent. Most of the gauge operational difficulties are due to electronic components. Therefore, we are proposing to contract maintenance of these gauges to a specialty contractor. We will report to council the results of these efforts by November 2001.

The Water Services Department appreciates the opportunity to comment on the report and associated recommendation. We also thank the City Auditor's Office for their efforts in this area.

Cc: Robert Collins, City Manager

